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Selected US specifications from IPC sub-class B62D

(54) Telescopic tube assembly

(57) A telescopic tube assembly suitable for use as a motor vehicle steering column which is resistant to buckling and adjustable for height, includes an inner tube (1) of triangular cross-section and an outer tube (2). The tubes (1,2) are made non-rotatable and play-free relative to each other in the overlap regions by two sliding bushes (5) cast or injection formed on to the inner tube (1), and are mounted to slide relative to each other on the longitudinal axis of the assembly. One side of the inner tube (1) has a recess (4) between the sliding bushes (5) and the overlap region in the region of one sliding bush (5) is of a twisted configuration as viewed in cross-section with respect to the overlap region in the region of the other sliding bush (5).

Fig. 1

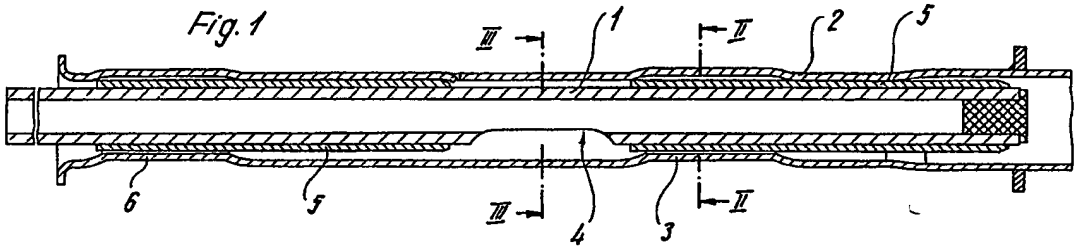
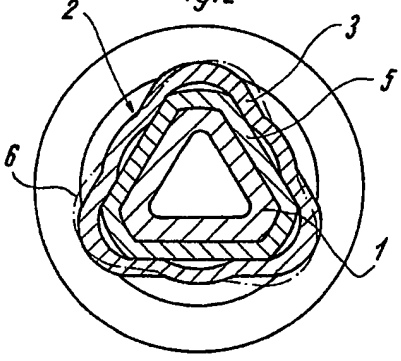


Fig. 2



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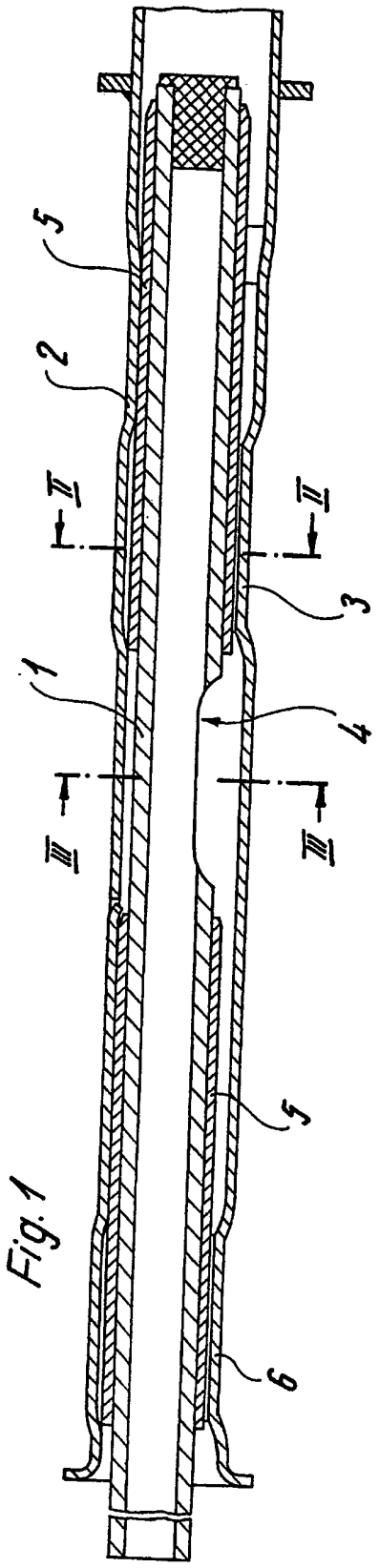

Fig. 1

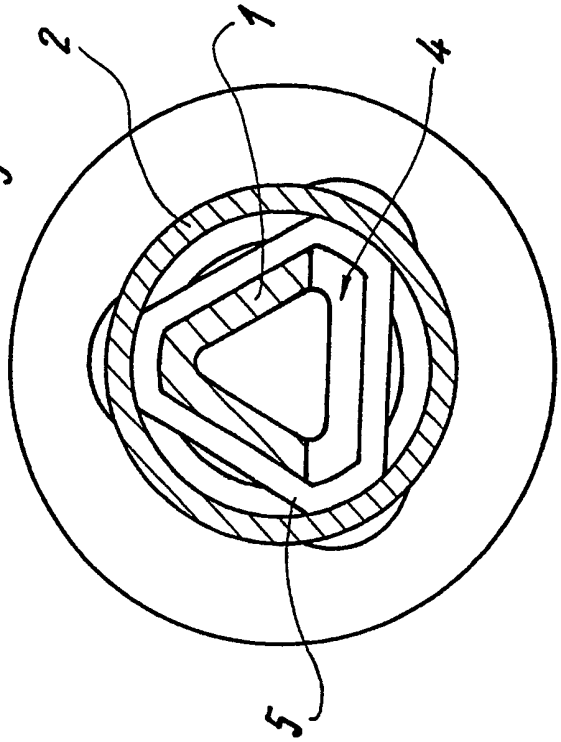

Fig. 3

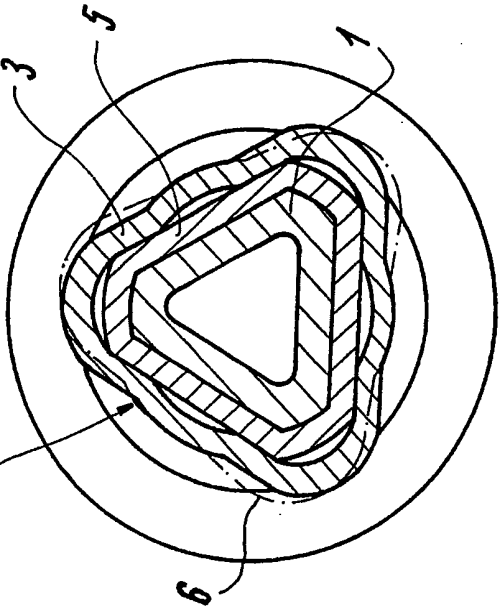

Fig. 2

SPECIFICATION

Telescopic tube assembly

This invention relates to a telescopic tube assembly suitable for use as a motor vehicle steering column which is resistant to buckling and adjustable for height, including an inner tube of triangular cross-section and an outer tube, which tubes are made non-rotatable and play-free relative to each other in the overlap regions by two sliding bushes cast or injection formed on to the inner tube, but which are slidable relative to each other on the longitudinal axis of the telescopic tube assembly.

Motor vehicle steering columns of this kind have long been known and have long been used in the automobile industry. In particular private cars of modern types nowadays reach speeds of over 200 kph. In this situation, known telescopic tubes give rise to problems which are found at least to be extremely disturbing. Thus for example at speeds of that kind, vibrations are generated which are in a range of 20 to 30 Hz and which cause the inner or outer tube of the telescopic tube assembly to go into a condition of natural oscillation such that even the slightest clearance between the inner and outer tubes is sufficient to cause rattling noises. That clearance can occur for example just because the sliding bushes, which are made of plastics material, contract under the influence of temperature, for example at a temperature which is below 20°C.

These is thus a need for a generally improved telescopic tube assembly having improved precise and play-free guidance of the inner tube in the outer tube under all conditions, using means which are very simple from a structural point of view.

According to the present invention there is provided a telescopic tube assembly, suitable for use as a motor vehicle steering column which is resistant to buckling and adjustable for height, including an inner tube of triangular cross-section and an outer tube, which tubes are made non-rotatable and play-free relative to each other in the overlap regions by two sliding bushes cast or injection formed on to the inner tube, but which are slidable relative to each other on the longitudinal axis of the telescopic tube assembly, wherein one side of the inner tube has a recess located between the sliding bushes and the overlap region in the region of one sliding bush is of a twisted configuration as viewed in cross-section with respect to the overlap region in the region of the other sliding bush.

The above-indicated arrangement of the cross-sectional planes relative to each other means that, when the inner tube is pushed into the outer tube, a rotary torque has to be applied, which results in deformation of the inner tube.

Preferably the above-mentioned deformation is in the range of elasticity of the inner tube, that is to say, a given angle of rotation about which one cross-sectional plane of one overlap region is twisted relative to a cross-sectional plane of the other overlap region and which is dependent on the dimensions and the material of the inner tube, may not be exceeded.

The fact that the inner tube is twisted in the elastic range means that a stress is produced, which at the same time represents a return force and presses the corresponding side surfaces of the inner tube against the side surfaces of the outer tube. This arrangement ensures absolute freedom from clearance between the inner tube and the outer tube, which is the case even when the sliding bushes shrink for example due to a drop in outside temperature, by a certain amount. Also, friction is produced, by the return force, between the sliding bushes of the inner and outer tubes, and such friction can be so controlled by establishing the above-indicated angle of rotation that it represents the optimum resistance for a motor vehicle steering column which is adjustable for height, for the purposes of height adjustment.

A further advantage of the configuration of the telescopic tube of the invention is that tolerances due to the production processes involved between the inner and outer tubes are positively compensated for.

For a better understanding of the present invention, and to show an embodiment of the innovation is described hereinafter with how the same may be carried into effect, reference will now be made, by way of example to the accompanying drawings in which:

Figure 1 is a view in longitudinal section through a telescopic tube assembly according to one embodiment of the invention,

Figure 2 is a view in cross-section through the telescopic tube assembly taken on line II-II in Figure 1, and

Figure 3 is a further cross-sectional view through the telescopic tube assembly taken on line III-III in Figure 1.

The telescopic tube assembly of the invention shown in Figure 1 includes an outer tube 2, and an inner tube 1 which is of triangular cross-section. Two sliding bushes 5 which are cast or injection formed on to the inner tube 1 and which are made from plastics material in known manner are located in the overlap regions between the inner tube 1 and the outer tube 2. The sliding bushes 5 form sliding bearings which permit satisfactory sliding movement of the inner tube 1 with respect to the outer tube 2.

According to the invention, between the sliding bushes 5 the inner tube has a recess 4 which in the present embodiment is formed by the wall of one limb of the triangular inner tube 1 being removed in the appropriate area. This can be seen particularly clearly from Figure 3.

As Figure 2 clearly shows, the outer tube 2 is also of a partially triangular configuration in the overlap regions. Figure 2 also shows the way in which the cross-sectional planes 3 and 6 are twisted relative to each other in accordance with the invention. In this connection, the cross-sectional plane 6 is shown in dash-dotted lines in Figure 2, for the sake of clarity of the drawing.

The inner tube 1 which is twisted within its elastic range accordingly acts virtually as a torsion spring.

It will be appreciated that, besides the illustrated

configuration of the recess 4, other forms of construction are also possible. The important consideration is the reduction in the moment of resistance in the corresponding region of the inner tube 1.

CLAIMS

1. A telescopic tube assembly, suitable for use as a motor vehicle steering column which is resistant to buckling and adjustable for height, including an inner tube of triangular cross-section and an outer tube, which tubes are made non-rotatable and play-free relative to each other in the overlap regions by two sliding bushes cast or injection formed on to the inner tube, but which are slidable relative to each other on the longitudinal axis of the telescopic tube assembly, wherein one side of the inner tube has a recess located between the sliding bushes and the overlap region in the region of one sliding bush is of a twisted configuration as viewed in cross-section with respect to the overlap region in the region of the other sliding bush.

2. A telescopic tube assembly according to claim 1, wherein the inserted inner tube is twisted within its elastic range.

3. A telescopic tube assembly according to claim 1, wherein the recess is formed by an interruption in the wall of a limb of the inner tube.

4. A telescopic tube assembly, substantially as hereinbefore described with reference to Figures 1 to 3 of the accompanying drawings.

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